The exception mentioned above is an extract from Clerk Maxwell, which is certainly erroneous, and from which Mr. O'Toole gets a good deal of fun. We will not suggest that the addition of a single word would make the passage correct, for we should be told that text-books ought to be perfect. But it is only just to mention that the error occurs in an explanation of the name; in the definition of the thing the error does not occur; nay, it is expressly contradicted.

After this is it not unkind to condemn those doctors who drop the name "potential E." and replace it with such phrases as "E. of repose," &c., implying that the energy in question is not due to motion? By-the-by where is the bull in "passive energy"? and what is the "action" that may be confounded with kinetic energy?

B.—*Potential E. as meaning "Energy related to Potential Functions."*

The word Potential may be used in a second sense. This of itself is a trouble to Mr. O'Toole; but—remembering that your readers may not sympathise with his undisguised antipathy to verbal skylarking—he hastens to add that the two meanings are not only heterogeneous but incompatible. "Surely there is no occasion to stop to prove this." Please do, Mr. O'Toole; we should like to hear you prove something.

It may be noted that in this opinion and in paragraph 9 he appears to differ from Thomson and Tait. (See their definition of Potential, *Nat. Phil.*, vol. i., § 485).

C.—*Potential E. as meaning "Energy of Potency"*

It appears from a foot-note that "potency" may mean a force. If so, it is strange that the O'Toole—who, throwing off his thin disguise, at the end of his letter undertakes the "duty" of a doctor, and tells us that potential E. should be the "energy of a force"—it is strange that Dr. O'Toole should object to the name on this ground.

But the remarks under this head are chiefly interesting, as indicating the *modus operandi* of our pseudo-Publius. He does not trouble to examine the definitions of "potential energy." He only looks for explanations of the word "potential." Finding scant material in the doctor's utterances, he resorts to his dictionary, hunts up the different meanings of "potential," adds to these their antitheses, and rends his phantoms to pieces. It is scarcely a parody upon his letter to say—we won't trouble about what a civil engineer is, but let us examine the meaning of *civil*. Now civil has——meanings: (A.) polite, (B.), &c. Therefore "civil E." means "polite E.," and "civil E." used as a *distinguishing* title cannot mean anything else than this, that the other E. is unpolite E.

As to the whereabouts of Potential Energy.

"We shall now pass from the perplexities connected with this unlucky name, 'potential E.,' to consider the behaviour of our teachers towards the thing itself." At last Mr. O'Toole will deign to discuss the definitions given by the doctors. Nay, he wanders away into an examination of such rash—but perhaps not inexcusable—phrases as "the potential E. of a raised weight," &c. The proper remedy for the troubles arising on this point is "to use words discreetly and consistently." But this is not sufficiently heroic. A local habitation must be found for this "potential E.," although it would seem as vain to inquire into the whereabouts of potential E. as into the whereabouts of Mr. O'Toole's scientific erudition. It is proposed to lodge this E. in the forces, and perhaps it won't do much harm, as we don't know where the forces are. It is proposed, moreover, to substitute "energy of tension" for "potential E." This done, the doctor's millennium will have come. Never mind about altering your conception of this kind of energy; call it by another name; give it a *weisnichtwo* lodging. There will be no more "confusion about fundamental principles;" there will be no more slips of the pen or tongue; there will be no more puzzled Publii; and last, but not least, there will be no more O'Tooles to bother the doctors. Well may "verbal skylarking" be despised. What is it beside such gigantic fun as this?

And yet I am sceptical. We started by hearing that it was "principally—though not entirely—the doctors who were to blame for this confusion about fundamental principles." Is this proved? Is not another cause indicated in the letter of of "E. G." (vol. xvii. p. 9)? And shall the doctors expect to be rightly understood when Dr. O'Toole's amanuensis admits (vol. xvi. p. 520) that Dr. O'Toole himself has been misapprehended upon almost every point by one reader at least?

Cirencester, November 13 H. W. LLOYD TANNER

Smell and Hearing in Moths

IN NATURE (vol. xvii. p. 72) your correspondent "E. H. K." observes: "'J. C.' seems to draw inferences that moths have not the power of smell, but have that of hearing. I feel quite certain they possess the former, but am in doubt about the latter. . . . .

"With reference to the sound of the glass, is it not the quick motion of the hand which disturbs the moth?"

May I draw the attention of both your correspondents to some experiments of mine on this subject which were published in NATURE about a year ago? These experiments, I remember, were quite sufficient to prove to me that moths have the power of hearing shrill notes; and, until I read the query of "E. H. K." above quoted, I thought that my account of these experiments must have been equally conclusive to any one who read them. On now referring to that account, however, I find that I there omitted to state one of the experiments which was resorted to for the purpose of avoiding the possible objection which "E. H. K." now advances. This experiment was a very simple one, consisting merely in making a sudden shrill whistle with my mouth by drawing the breath inwards, so as not to disturb the air in the neighbourhood of the insect. The latter, however, always responded to this as to other sounds in the way described, although throughout the experiment I took care not to move any part of my body.

GEORGE J. ROMANES

IT was because of my knowledge of facts like those named by "E. H. K." that I was surprised at the apparent inability of moths to smell ammonia. Being no physiologist, I ventured to draw no inferences; but it occurred to me to wonder whether the sense of smell differs in kind with different organisations; whether, for instance, some substances strongly odorous to us may be quite inodorous to insects, and *vice versâ*.

As to the experiment on hearing, I do not think it was the movement of the hand which startled the moths. It may conceivably have been the vibration of their wings set up by the sound; but the experiment can easily be repeated with variations by any one interested in the subject. J. C.

Loughton

Meteorological Phenomenon

THIS morning at about a quarter before ten the sky here presented a most unusual appearance. The air was calm and the sun shining, but not brightly, through a slight veil of cirro-stratus. The sky was mostly covered with fibrous clouds of cirrus or cirro-stratus (I am not quite sure which I ought to call it), the fibres being quite parallel to each other, but in two different strata; those of one stratum were approximately from north-east to south-west, those of the other from north-west to south-east—so that they seemed to cross each other like the threads of a woven fabric. I think the fibres from north-east to south-west were the highest, but am not quite sure, though it seemed the same to another who was looking on with me.

JOSEPH JOHN MURPHY

Old Forge, Dunmurry, Co. Antrim, November 25

OUR ASTRONOMICAL COLUMN

STELLAR SYSTEMS.—M. Flammarion, in various notes communicated recently to the Paris Academy of Sciences, has been drawing attention to stars which appear to be affected with a common proper motion, or a motion similar in amount and in its direction. Several of his cases, however, are by no means to be styled "Nouveaux systèmes Stellaires." Thus the large and uniform proper motions of the southern stars ζ^1 and ζ^2 Reticuli, to which he refers in the *Comptes Rendus* of November 5, were the subject of remark in NATURE, vol. xi. p. 328. That there was a probability of a common proper motion in these stars would be evident to any one who inspected the columns in the British Association Catalogue, published in 1845, but as Taylor had not observed them, and the comparison was consequently dependent upon Lacaille and Brisbane only, there was a possibility of mistake. The first confirmation of the large proper motion of the B.A.C. in ζ^1 was afforded in Jacob's "mean places of 1440 stars"—from the Madras observations 1849-53, and

the earliest proof of a common translation in space was given by the same observer from the Madras observations 1853-58, which formed a part of vol. xxviii. of the *Memoirs* of the Royal Astronomical Society. Not having seen any distinct reference to the very large and uniform motions of these stars in astronomical treatises, we adverted to them in NATURE as above.

Again, the common proper motions of Regulus and Lalande 19749, mentioned by M. Flammarion in the same communication have been long remarked. The same may be said in the case of 9 and 10 Ursæ Majoris, one of the systems to which he refers in a paper presented to the Academy on November 12. Any one who has carefully utilised the very valuable fourteenth volume of the Dorpat observations must have been familiar with this case, and, we may add many similar ones, though the proper motions involved may be to smaller amount. This volume contains Mädler's laborious work upon 3222 of Bradley's stars, of which he gives positions reduced to 1850, and where all the catalogues available at the time and considered deserving of confidence were brought to bear. Not the least important feature in this work is the addition of two columns, not usually found in catalogues, containing the amount of secular proper motion in arc of great circle (r) and the angular direction of this motion (ϕ) counted from north round by east to 360°. On p. 155 we have—

For 9 ι Ursæ Majoris ... $r = 52''{\cdot}5$ ... $\phi = 238°{\cdot}9$
„ 10 „ ... $r = 52''{\cdot}6$ ... $\phi = 238°{\cdot}5$

But, as we have stated, other similar cases are readily detected by an inspection of these columns. For instance: in γ and 58 Tauri, distant 35′, where $r = 13''$, $\phi = 97°$; in 66 and 68 Draconis, distant 43′, $r = 13''{\cdot}5$, ϕ about 69° and for wider stars, in 26 and 34 Pegasi, distant 4° 25′, where $r = 30''$, $\phi = 84°$; in η and 10 Arietis, distant 5° 11′, $r = 15''{\cdot}5$, $\phi = 86°$, with other neighbouring stars, moving in nearly the same direction, and again in μ and 54 Aquilæ, distant 5° 13′, $r = 27''$, $\phi = 121°$. The list might be largely increased.

It is nevertheless to be expected that the researches which M. Flammarion is so industriously following up with respect to stellar systems may lead to a considerable addition to our knowledge of them, in cases which are not thus easily discovered from existing catalogues, particularly by determining the proper motions of stars, not yet submitted to such investigation.

THE MINOR PLANETS.—A letter from Prof. Watson, of Ann Arbor, U.S., to M. Yvon Villarceau, dated November 5, deranges the ordinal numbers of the small planets given in this column last week, from No. 175 onwards. It appears that on October 1 he discovered a planet 10m., which he duly notified by telegraph to the Smithsonian Institution, but by some unexplained circumstance the information was not transmitted by cable to the Observatory of Paris, as usual with such discoveries. Supposing this object to be really a *new* planet, it will be No. 175, and the subsequent discoveries mentioned last week will be on the same supposition, advanced a unit. Elements of No. 172 appear in *Astron. Nach.*, No. 2,176, and of No. 176 in the Paris *Bulletin International* of November 25.

THE CORDOBA OBSERVATORY.—Within the last few days, Mr. John M. Thome, the zealous co-operator with Dr. B. A. Gould in the important astronomical work carried on for several years past at the Observatory of the Argentine Republic, has visited this country on his return to Cordoba from the United States. We have seen in his hands proofs of the charts of the Argentine "Uranometria," which are on a much larger scale than those of Argelander, Heis, and Behrmann. They have been engraved in New York. This work is expected to be soon published; also large lunar photographs taken at Cordoba. All the stars in the "Uranometria" have been meridionally observed.

CARL VON LITTROW

CARL LUDWIG VON LITTROW, whose death has been announced during the past week, was born at Kasan on July 18, 1811. His father, Joseph Johann von Littrow, the eminent astronomer, afterwards Director of the Imperial Observatory at Vienna, was at that time Professor of Astronomy in the University of Kasan, where he founded an observatory. The son was educated under the father's direction, and in 1831 was appointed assistant at the Observatory at Vienna, of which institution the elder Littrow had taken the superintendence in 1819, removing thence from Ofen. In 1835 he first appeared as an astronomical writer, having in that year published an account of Hell's Journey to Wardoe and of his Observations of the Transit of Venus in 1769 at that place, from the original day-books; also a History of the Discovery of General Gravitation, by Newton, and Treatises upon Comets, more especially on Halley's, which was then appearing. In 1839 he published at Stutgard a Celestial Atlas, and a work which in the Catalogue of the Pulkova Library is called a Translation of Airy's "Populäre physische Astronomie," by which is most probably intended the well-known Treatise on Gravitation published by the Astronomer-Royal in 1834, though elsewhere Littrow's work is stated to refer to the history of Astronomy during the early part of the nineteenth century, presented to the British Association in 1832.

In 1842 Carl von Littrow succeeded his father as Director of the Observatory of Vienna, and the establishment has continued in vigorous activity under his charge. He has principally devoted the energies of the Observatory to equatorial astronomy, following up with diligence the observations of comets and planets, and with the aid of able assistants determining their orbits. Some of the most complete cometary discussions have emanated from the Observatory of Vienna while under his charge. The *Annalen der Sternwarte in Wien*, have been continued, and valuable astronomical work is contained in them, as for instance in the first volume of the third series, which appeared in 1851, where we have the positions of the stars in Argelander's Northern Zones reduced by Oeltzen to 1842, the epoch for which elements of reduction were given in the Bonn volume. Littrow was a frequent contributor to the publications of the Vienna Academy. In one of his memoirs—"Bahnähen zwischen den periodischen gestirnen des Sonnensystems," printed in the *Sitzungsberichte* of the Academy for January, 1854, he applied an original process of investigation of the points of nearest approach amongst the orbits of the small planets discovered up to that time, and the orbits of the periodical comets—a troublesome work in which mechanical aid was introduced; the result was the discovery of many close approximations of planets with planets, planets with comets, and of comets with comets; amongst the latter near approaches of Biela's comet to the orbit of Halley's in 35° and 198° heliocentric longitude. When interest was excited relative to the expected return of the comet of 1556, which at that period was supposed to have been previously observed in 1264, Littrow was the means of bringing to light an unknown treatise by Heller, which, with the chart of Fabricius, has allowed of a much improved determination of the orbit, and similarly he made known interesting particulars with reference to the remarkable observation by Steinheibel and Stark of a rapidly-moving black spot upon the sun's disc on February 12, 1820. Littrow was a constant contributor to the columns of the *Astronomische Nachrichten*. The names of Hornstein, Oeltzen, Weiss, Schulhof, and others are well known in connection with the work of the Vienna Observatory during Littrow's direction. His death occurred on the 16th inst.

Von Littrow's wife, Auguste Littrow-Bischoff, is one of the best known Austrian authoresses of the present time. The genial qualities of the astronomer and his wife made